SHEAR AND EXTENSIONAL RHEOLOGY OF PARTICLE-FILLED BOGER FLUIDS

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Particle suspensions with a non-Newtonian matrix fluid are an industrially-important class of materials with applications in diverse areas such as plastic mouldings, ceramic pastes, paints, food, cosmetics and detergents. The final properties of such suspensions can be greatly influenced by the shape, concentration and size of the suspended filler particles. In this poster we present the results of shear and extensional rheological studies of fluids comprised of filler particles suspended in a polystyrene/oligomeric styrene Boger fluid. Apart from the Boger fluid itself, which we use as a control sample, we study a 3.5 vol.% suspension of highly spherical and monodisperse 6.5 μm diameter PMMA microspheres. The rheological measurements of this system can be compared with dilute solution theory and simulations, and this fluid will subsequently be used as a test fluid in filament stretching rheometer tests aboard the International Space Station. Another test fluid consists of suspensions of an artificial lunar soil, or *regolith*. The regolith is composed of highly irregularly-shaped mineral particles and has a wide polydispersity in particle size spanning ~ 5 – 100 μm in diameter. It is widely recognised that any future mission to establish a lunar base would necessarily have to make use of lunar regolith as a construction material. One possible way of achieving this is by using regolith as a filler bound in a polymeric matrix. We study the properties of non-Newtonian regolith suspensions at concentrations of 3.5, 7.0 and 10.5 vol.% using techniques including steady and oscillatory shear, capillary break-up extensional rheometry (CaBER), and rod climbing measurements.